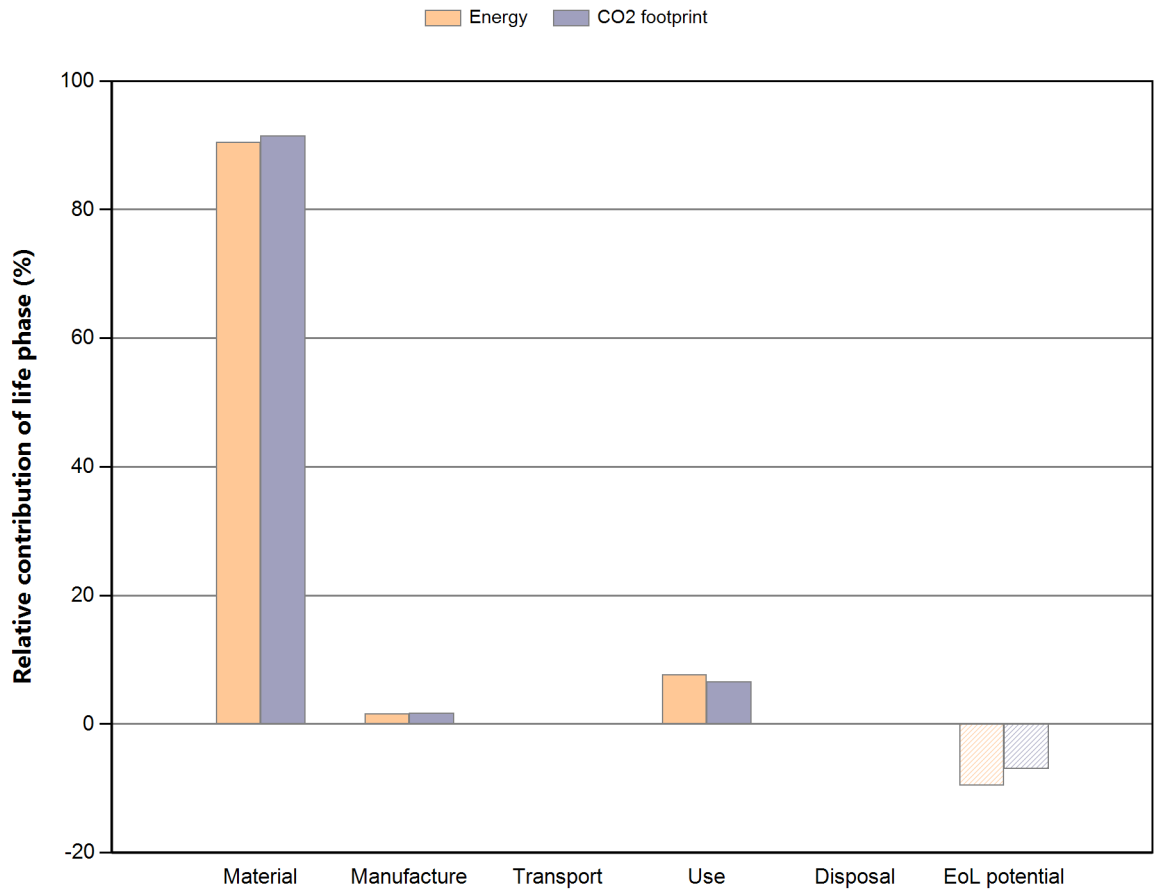
Eco Audit Report

Product name	OpenScope: 3D Printed Microscope
Country of use	United Kingdom
Product life (years)	1

Summary:

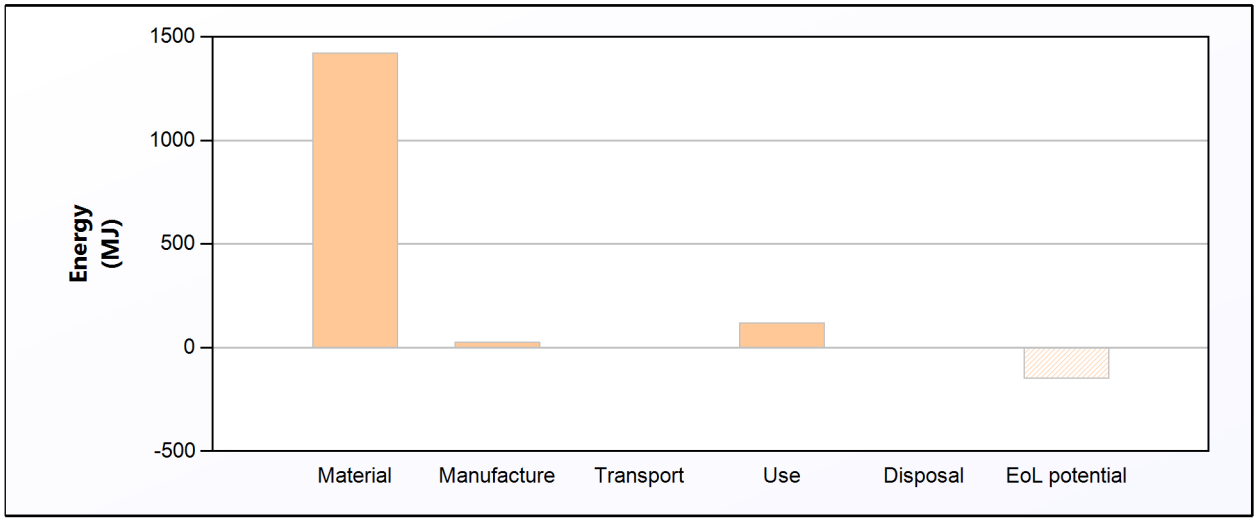


Energy details CO2 footprint details

Phase	Energy (MJ)	Energy (%)	CO2 footprint (kg)	CO2 footprint (%)
Material	1.42e+03	90.5	103	91.5
Manufacture	25.2	1.6	1.9	1.7
Transport	1.44	0.1	0.102	0.1
Use	120	7.7	7.49	6.6
Disposal	1.87	0.1	0.131	0.1
Total (for first life)	**1.57e+03**	**100**	**113**	**100**
End of life potential	-150		-7.81	

Energy Analysis

Summary



	Energy (MJ/year)
Equivalent annual environmental burden (averaged over 1 year product life):	1.57e+03

Detailed breakdown of individual life phases

Material:

Summary

Component	Material	Recycled content* (%)	Part mass (kg)	Qty.	Total mass (kg)	Energy (MJ)	%
3D Printed Chassis	Polylactide (PLA)	Virgin (0%)	0.1	1	0.1	5.2	0.4
screws 25mm	Medium carbon steel	Virgin (0%)	0.046	2	0.092	2.4	0.2
screw 40mm	Medium carbon steel	Virgin (0%)	0.043	1	0.043	1.1	0.1
washers	Low carbon steel	Virgin (0%)	0.032	3	0.096	2.5	0.2
nuts	Low carbon steel	Virgin (0%)	0.069	3	0.21	5.4	0.4
arduino	Copper	Virgin (0%)	0.014	1	0.014	0.84	0.1
arduino	Epoxies	Virgin (0%)	0.014	1	0.014	1.9	0.1
rasp pi + cam	Copper	Virgin (0%)	0.022	1	0.022	1.3	0.1
rasp pi + cam	Epoxies	Virgin (0%)	0.022	1	0.022	2.9	0.2
LED	Diodes and LEDs	Virgin (0%)	0.0006	2	0.0012	5.6	0.4
resistors	Resistors	Virgin (0%)	0.0005	3	0.0015	1.5	0.1
breadboard	Nickel	Virgin (0%)	0.041	1	0.041	7	0.5
breadboard	Acrylonitrile butadiene styrene (ABS)	Virgin (0%)	0.041	1	0.041	3.9	0.3
ethernet cable/wire	Copper	Virgin (0%)	0.44	1	0.44	26	1.8
ethernet cable/wire	Polyvinylchloride (tpPVC)	Virgin (0%)	0.44	1	0.44	26	1.8
stepper motor	Stainless steel	Virgin (0%)	0.08	3	0.24	20	1.4
stepper motor	Single crystalline silicon, electronics	Virgin (0%)	0.08	3	0.24	1.2e+03	83.7
stepper motor	Cast Al-alloys	Virgin (0%)	0.16	3	0.48	96	6.8
cable	Cable	Virgin (0%)	0.029	1	0.029	2.6	0.2
9V batteries	Alkaline AA cell battery	Virgin (0%)	0.46	1	0.46	19	1.4
Total				**34**	**3**	**1.4e+03**	**100**

*Typical: Includes 'recycle fraction in current supply'

Manufacture:

Summary

Component	Process	Amount processed	Energy (MJ)	%
3D Printed Chassis	Polymer molding	0.1 kg	1.6	6.4
screws 25mm	Extrusion, foil rolling	0.092 kg	0.57	2.3
screw 40mm	Extrusion, foil rolling	0.043 kg	0.27	1.1
washers	Casting	0.096 kg	1.1	4.4
nuts	Casting	0.21 kg	2.4	9.5
arduino	Extrusion, foil rolling	0.014 kg	0.059	0.2
arduino	Polymer molding	0.014 kg	0.31	1.2
rasp pi + cam	Extrusion, foil rolling	0.022 kg	0.092	0.4
rasp pi + cam	Polymer molding	0.022 kg	0.48	1.9
breadboard	Extrusion, foil rolling	0.041 kg	0.099	0.4
breadboard	Polymer molding	0.041 kg	0.85	3.4
ethernet cable/wire	Wire drawing	0.44 kg	6.5	25.7
ethernet cable/wire	Polymer extrusion	0.44 kg	2.6	10.3
stepper motor	Casting	0.24 kg	2.7	10.8
stepper motor	Casting	0.48 kg	5.6	22.0
Total			**25**	**100**

Transport:

Summary

Breakdown by transport stage

Stage name	Transport type	Distance (km)	Energy (MJ)	%
All goods sourced locally	Light goods vehicle	3.4e+02	1.4	100.0
Total		**3.4e+02**	**1.4**	**100**

Breakdown by components

Component	Mass (kg)	Energy (MJ)	%
3D Printed Chassis	0.1	0.048	3.3
screws 25mm	0.092	0.044	3.0
screw 40mm	0.043	0.02	1.4
washers	0.096	0.046	3.2
nuts	0.21	0.099	6.9
arduino	0.014	0.0067	0.5
arduino	0.014	0.0067	0.5
rasp pi + cam	0.022	0.01	0.7
rasp pi + cam	0.022	0.01	0.7
LED	0.0012	0.00057	0.0
resistors	0.0015	0.00071	0.0
breadboard	0.041	0.02	1.4
breadboard	0.041	0.02	1.4
ethernet cable/wire	0.44	0.21	14.5
ethernet cable/wire	0.44	0.21	14.5
stepper motor	0.24	0.11	7.9
stepper motor	0.24	0.11	7.9
stepper motor	0.48	0.23	15.9
cable	0.029	0.014	1.0
9V batteries	0.46	0.22	15.2
Total	**3**	**1.4**	**100**

Use:

Summary

Static mode

Energy input and output type	Electric to mechanical (electric motors)
Country of use	United Kingdom
Power rating (W)	36
Usage (hours per day)	2
Usage (days per year)	2.1e+02
Product life (years)	1

Relative contribution of static and mobile modes

Mode	Energy (MJ)	%
Static	1.2e+02	100.0
Mobile	0	
Total	**1.2e+02**	**100**

Disposal:

Summary

Component	End of life option	Energy (MJ)	%
3D Printed Chassis	Recycle	0.07	3.7
screws 25mm	Recycle	0.064	3.4
screw 40mm	Recycle	0.03	1.6
washers	Recycle	0.067	3.6
nuts	Recycle	0.14	7.8
arduino	Recycle	0.0098	0.5
arduino	Landfill	0.0028	0.1
rasp pi + cam	Recycle	0.015	0.8
rasp pi + cam	Landfill	0.0044	0.2
LED	Landfill	0.00024	0.0
resistors	Landfill	0.0003	0.0
breadboard	Recycle	0.029	1.5
breadboard	Recycle	0.029	1.5
ethernet cable/wire	Recycle	0.31	16.4
ethernet cable/wire	Recycle	0.31	16.4
stepper motor	Recycle	0.17	9.0
stepper motor	Landfill	0.048	2.6
stepper motor	Recycle	0.34	18.0
cable	Landfill	0.0058	0.3
9V batteries	Downcycle	0.23	12.3
Total		**1.9**	**100**

EoL potential:

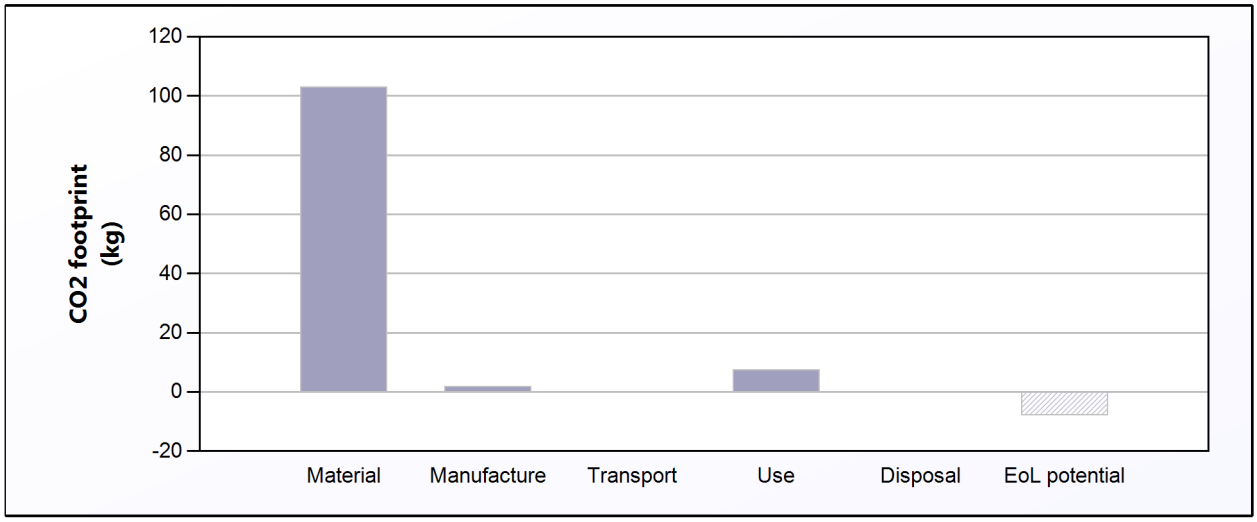
Component	End of life option	Energy (MJ)	%
3D Printed Chassis	Recycle	-1.5	1.0
screws 25mm	Recycle	-1.8	1.2
screw 40mm	Recycle	-0.82	0.5
washers	Recycle	-1.8	1.2
nuts	Recycle	-3.9	2.6
arduino	Recycle	-0.65	0.4
arduino	Landfill	0	0.0
rasp pi + cam	Recycle	-1	0.7
rasp pi + cam	Landfill	0	0.0
LED	Landfill	0	0.0
resistors	Landfill	0	0.0
breadboard	Recycle	-5.8	3.9
breadboard	Recycle	-2	1.3
ethernet cable/wire	Recycle	-20	13.5
ethernet cable/wire	Recycle	-9.8	6.5
stepper motor	Recycle	-16	10.7
stepper motor	Landfill	0	0.0
stepper motor	Recycle	-84	56.4
cable	Landfill	0	0.0
9V batteries	Downcycle	0	0.0
Total		**-1.5e+02**	**100**

Notes:

Summary

CO2 Footprint Analysis

Summary



	CO2 (kg/year)
Equivalent annual environmental burden (averaged over 1 year product life):	113

Detailed breakdown of individual life phases

Material:

Summary

Component	Material	Recycled content* (%)	Part mass (kg)	Qty.	Total mass (kg)	CO2 footprint (kg)	%
3D Printed Chassis	Polylactide (PLA)	Virgin (0%)	0.1	1	0.1	0.36	0.3
screws 25mm	Medium carbon steel	Virgin (0%)	0.046	2	0.092	0.17	0.2
screw 40mm	Medium carbon steel	Virgin (0%)	0.043	1	0.043	0.078	0.1
washers	Low carbon steel	Virgin (0%)	0.032	3	0.096	0.17	0.2
nuts	Low carbon steel	Virgin (0%)	0.069	3	0.21	0.37	0.4
arduino	Copper	Virgin (0%)	0.014	1	0.014	0.052	0.1
arduino	Epoxies	Virgin (0%)	0.014	1	0.014	0.1	0.1
rasp pi + cam	Copper	Virgin (0%)	0.022	1	0.022	0.082	0.1
rasp pi + cam	Epoxies	Virgin (0%)	0.022	1	0.022	0.16	0.2
LED	Diodes and LEDs	Virgin (0%)	0.0006	2	0.0012	0.28	0.3
resistors	Resistors	Virgin (0%)	0.0005	3	0.0015	0.084	0.1
breadboard	Nickel	Virgin (0%)	0.041	1	0.041	0.47	0.5
breadboard	Acrylonitrile butadiene styrene (ABS)	Virgin (0%)	0.041	1	0.041	0.16	0.2
ethernet cable/wire	Copper	Virgin (0%)	0.44	1	0.44	1.6	1.6
ethernet cable/wire	Polyvinylchloride (tpPVC)	Virgin (0%)	0.44	1	0.44	1.1	1.1
stepper motor	Stainless steel	Virgin (0%)	0.08	3	0.24	1.2	1.2
stepper motor	Single crystalline silicon, electronics	Virgin (0%)	0.08	3	0.24	89	86.5
stepper motor	Cast Al-alloys	Virgin (0%)	0.16	3	0.48	5.8	5.6
cable	Cable	Virgin (0%)	0.029	1	0.029	0.2	0.2
9V batteries	Alkaline AA cell battery	Virgin (0%)	0.46	1	0.46	1.4	1.4
Total				**34**	**3**	**1e+02**	**100**

*Typical: Includes 'recycle fraction in current supply'

Manufacture:

Summary

Component	Process	Amount processed	CO2 footprint (kg)	%
3D Printed Chassis	Polymer molding	0.1 kg	0.12	6.4
screws 25mm	Extrusion, foil rolling	0.092 kg	0.043	2.3
screw 40mm	Extrusion, foil rolling	0.043 kg	0.02	1.1
washers	Casting	0.096 kg	0.084	4.4
nuts	Casting	0.21 kg	0.18	9.5
arduino	Extrusion, foil rolling	0.014 kg	0.0044	0.2
arduino	Polymer molding	0.014 kg	0.025	1.3
rasp pi + cam	Extrusion, foil rolling	0.022 kg	0.0069	0.4
rasp pi + cam	Polymer molding	0.022 kg	0.039	2.0
breadboard	Extrusion, foil rolling	0.041 kg	0.0075	0.4
breadboard	Polymer molding	0.041 kg	0.063	3.3
ethernet cable/wire	Wire drawing	0.44 kg	0.49	25.7
ethernet cable/wire	Polymer extrusion	0.44 kg	0.2	10.3
stepper motor	Casting	0.24 kg	0.2	10.8
stepper motor	Casting	0.48 kg	0.42	22.0
Total			**1.9**	**100**

Transport:

Summary

Breakdown by transport stage

Stage name	Transport type	Distance (km)	CO2 footprint (kg)	%
All goods sourced locally	Light goods vehicle	3.4e+02	0.1	100.0
Total		**3.4e+02**	**0.1**	**100**

Breakdown by components

Component	Mass (kg)	CO2 footprint (kg)	%
3D Printed Chassis	0.1	0.0034	3.3
screws 25mm	0.092	0.0031	3.0
screw 40mm	0.043	0.0015	1.4
washers	0.096	0.0032	3.2
nuts	0.21	0.007	6.9
arduino	0.014	0.00047	0.5
arduino	0.014	0.00047	0.5
rasp pi + cam	0.022	0.00074	0.7
rasp pi + cam	0.022	0.00074	0.7
LED	0.0012	4.1e-05	0.0
resistors	0.0015	5.1e-05	0.0
breadboard	0.041	0.0014	1.4
breadboard	0.041	0.0014	1.4
ethernet cable/wire	0.44	0.015	14.5
ethernet cable/wire	0.44	0.015	14.5
stepper motor	0.24	0.0081	7.9
stepper motor	0.24	0.0081	7.9
stepper motor	0.48	0.016	15.9
cable	0.029	0.00098	1.0
9V batteries	0.46	0.016	15.2
Total	**3**	**0.1**	**100**

Use:

Summary

Static mode

Energy input and output type	Electric to mechanical (electric motors)
Country of use	United Kingdom
Power rating (W)	36
Usage (hours per day)	2
Usage (days per year)	2.1e+02
Product life (years)	1

Relative contribution of static and mobile modes

Mode	CO2 footprint (kg)	%
Static	7.5	100.0
Mobile	0	
Total	**7.5**	**100**

Disposal:

Summary

Component	End of life option	CO2 footprint (kg)	%
3D Printed Chassis	Recycle	0.0049	3.7
screws 25mm	Recycle	0.0045	3.4
screw 40mm	Recycle	0.0021	1.6
washers	Recycle	0.0047	3.6
nuts	Recycle	0.01	7.8
arduino	Recycle	0.00069	0.5
arduino	Landfill	0.0002	0.1
rasp pi + cam	Recycle	0.0011	0.8
rasp pi + cam	Landfill	0.00031	0.2
LED	Landfill	1.7e-05	0.0
resistors	Landfill	2.1e-05	0.0
breadboard	Recycle	0.002	1.5
breadboard	Recycle	0.002	1.5
ethernet cable/wire	Recycle	0.021	16.4
ethernet cable/wire	Recycle	0.021	16.4
stepper motor	Recycle	0.012	9.0
stepper motor	Landfill	0.0034	2.6
stepper motor	Recycle	0.024	18.0
cable	Landfill	0.00041	0.3
9V batteries	Downcycle	0.016	12.3
Total		**0.13**	**100**

EoL potential:

Component	End of life option	CO2 footprint (kg)	%
3D Printed Chassis	Recycle	-0.073	0.9
screws 25mm	Recycle	-0.11	1.5
screw 40mm	Recycle	-0.053	0.7
washers	Recycle	-0.12	1.5
nuts	Recycle	-0.26	3.3
arduino	Recycle	-0.037	0.5
arduino	Landfill	0	0.0
rasp pi + cam	Recycle	-0.058	0.7
rasp pi + cam	Landfill	0	0.0
LED	Landfill	0	0.0
resistors	Landfill	0	0.0
breadboard	Recycle	-0.38	4.8
breadboard	Recycle	-0.008	0.1
ethernet cable/wire	Recycle	-1.2	14.8
ethernet cable/wire	Recycle	0.15	-1.9
stepper motor	Recycle	-0.86	11.0
stepper motor	Landfill	0	0.0
stepper motor	Recycle	-4.9	62.1
cable	Landfill	0	0.0
9V batteries	Downcycle	0	0.0
Total		**-7.8**	**100**

Notes:

Summary